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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/996,755	11/30/2001	Nobuo Kino	040679-1392	4894

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EXAMINER

WILKINS III, HARRY D

ART UNIT	PAPER NUMBER
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1742

DATE MAILED: 06/09/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/996,755

Applicant(s)

KINO ET AL.

Examiner

Harry D Wilkins, III

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 05 May 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 30 November 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s) _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

1. The rejection under 35 USC 112, 2nd paragraph has been withdrawn in view of Applicant's amendment.
2. The rejection under 35 USC 103 based on Takemura in view of Seki and Kokubu has been withdrawn in view of Applicant's comments.
3. However, new grounds of rejection are presented below with reference to the newly found reference Miyasaka.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 1-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takemura et al (US 6,440,232) in view of Miyasaka (US 6,018,854) and Kokubu et al (US 5,556,348).

Regarding claims 6, 8, 11-15, Takemura et al teach (see abstract) a method of producing a rolling element for a continuously variable transmission (CVT) with components such as a power roller bearing, an input disk and an output disk, wherein at least one of these has a surface that is made of a steel with 0.5-3.0 wt% Cr and 0.1-3.0 wt% Mo and has been treated by carbonitriding followed by hardening (quenching, see fig. 3A). The component has a surface residual austenite content of 20-45 vol% and

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surface hardness of HV 720 or more (i.e.-before any further treatment such as shot peening).

Takemura et al does not teach applying shot peening to the outer surface of the workpiece or subjecting the outer surface of the workpiece to finish grinding.

Miyasaka teaches (see abstract) a method of shot peening a metal surface.

Miyasaka teaches (see col. 9, line 7 to col. 10, line 21) that shot peening with 50 μm diameter shot is applied to a metal material, SCM420 (0.9-1.2 wt% Cr, 0.15-0.30 wt% Mo), which falls within the compositional ranges of Takemura et al, and that the process provides a surface compressive residual stress of 1500 MPa and a surface hardness of 1000 Hv when the shot peening is carried out for 60 seconds.

Therefore, it would have been obvious to one of ordinary skill in the art to have applied the shot peening method of Miyasaka to the carbonitrided steel of Takemura et al because the shot peening method of Miyasaka provides high compressive residual stresses and hardness.

Kokubu et al teach (see abstract) a method of treating a CVT rolling surface that includes carbonitriding and grinding. Kokubu et al teach (see col 3, lines 45-67) that the grinding is applied after carbonitriding to provide an optimum depth of carbonitriding, thereby reducing flaking and increasing fatigue fracture strength.

Therefore, it would have been obvious to one of ordinary skill in the art to have applied the grinding step of Kokubu et al to the CVT rolling surface of Takemura et al because the grinding step reduces flaking and increases fatigue fracture strength.

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Regarding the limitations that after grinding the component has hardness of at least HV 750, compressive residual stresses of at least 1000 MPa and a residual austenite content of not more than 10% by volume, Miyasaka teaches that the shot peening of a SCM420 product with a surface hardness of 700 Hv with 50 μ m diameter shot for 60 seconds produces surface hardness of 1000 Hv, 1500 MPa compressive residual stresses and a fully martensitic microstructure (i.e.-no residual austenite).

Regarding claim 7, conventional gas phase carburizing can occur in a vacuum furnace or a plasma furnace (for support see Kubota at col 6, lines 10-19). Therefore, it would have been obvious to one of ordinary skill in the art to have applied the gas-phase carburizing of Takemura et al in a conventional manner.

Regarding claim 9, Takemura et al in view of Miyasaka and Kokubu et al do not teach grinding the surface between the carbonitriding and shot peening steps. However, it was known in the art (for support see Seki et al teach at paragraphs 2-3) that an "abnormal" surface layer (containing impurities such as oxides) is formed during the carburizing (carbonitriding). Grinding is known (see Kokubu et al) to remove the top surface layer of a component. Therefore, it would have been obvious to one of ordinary skill in the art to have applied a grinding step between the carbonitriding and shot peening steps in order to remove the "abnormal" layer from the surface of the carbonitrided steel. The shot peening step of Miyasaka would still be applied for the purpose of imparting residual compressive stress and increased hardness.

Regarding claim 10, see above regarding claim 7.

Regarding claims 16-20, see above regarding claims 10 and 11-15.

Regarding claims 1-5, Takemura et al in view of Miyasaka and Kokubu et al teach an rolling contact portions of the CVT that have the outer surface hardness of about 1000 Hv, surface residual compressive stress of about 1500 MPa and zero residual surface austenite content. Takemura et al teach (see col 1, line 5 to col 2, line 63 and figs. 1 and 2) a CVT with a plurality of rolling members, including input (2) and output (3) disks arranged in a coaxial and spaced relation to each other, a power roller (11) interposed there between including an inner race (10) and outer race (13) with a lubricating oil present with balls (12) contacting the inner and outer races. Takemura et al teach (see col 3, lines 8-20) that at least one of the rolling contact portions of the inner and outer races of the power roller bearing, the input disk and the output disk are treated by carbonitriding.

Response to Arguments

6. Applicant's arguments with respect to claims 1-20 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Harry D Wilkins, III whose telephone number is 703-305-9927. The examiner can normally be reached on M-Th 10:00am-8:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy V King can be reached on 703-308-1146. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-872-9311 for After Final communications.

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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

Harry D Wilkins, III
Examiner
Art Unit 1742

hdw
June 4, 2003


ROY KING
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700